

NEW FORM OF THUJA OCCIDENTALIS RESEMBLING KNOWN CULTIVARS

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In 1963 the author visited the canyon of the Barron River in Algonquin Provincial Park, Ontario at latitude 45°54' N and longitude 77°38'-39' W. Normal *Thuja occidentalis* L. grows on slopes at the foot of cliffs in this mile long fault in granitic gneiss. On several talus formations there are dwarf forms, barely a meter high, with dead tops, compact, prostrate branching and normal leaf development. One dwarf shrub of very unusual form was found (Moore, 1964) on a north facing rock slide covered with a carpet of chasmophytic ferns, *Cladonia* and bryophytes such as *Hedwigia* and *Polytrichum*. A specimen was sent to the Plant Research Institute, Dept. of Agriculture, Ottawa. Drs. W. G. Dore and C. Frankton were unfamiliar with the shrub but established the anatomy of the stem as that of a conifer and the odor as that of Eastern white cedar (Frankton in litt., 1963). In 1968 Dr. R. E. Beschel, Queen's University, Kingston, Ont. visited the shrub and noted its resemblance to certain bizarre cultivars. Both he and Mr. E. Perem of the Wood Anatomy Group, Eastern Forest Products Laboratory, Ottawa considered that the wood anatomy corresponded with the description given for *T. occidentalis* (Arbor vitae).

DESCRIPTION

The shrub has a central stem 0.8 m high, with eight branches up to 2 m in length on the lower half. Of these, two come from beneath the rock and are in a prostrate position. The branches may have three orders of branching and bear live or dead leaves. They are basically of three types:

(1) About 75% are whip-like, sparingly ramified, with four rows of equal, appressed-decussate, ovate, keeled and pointed leaves 3-5 mm long (Fig. 1; 2A, 2B. Fig. 2A). The overall tetragonal habit of the branches resembles strongly some appressed species of *Cassiope* D. Don.

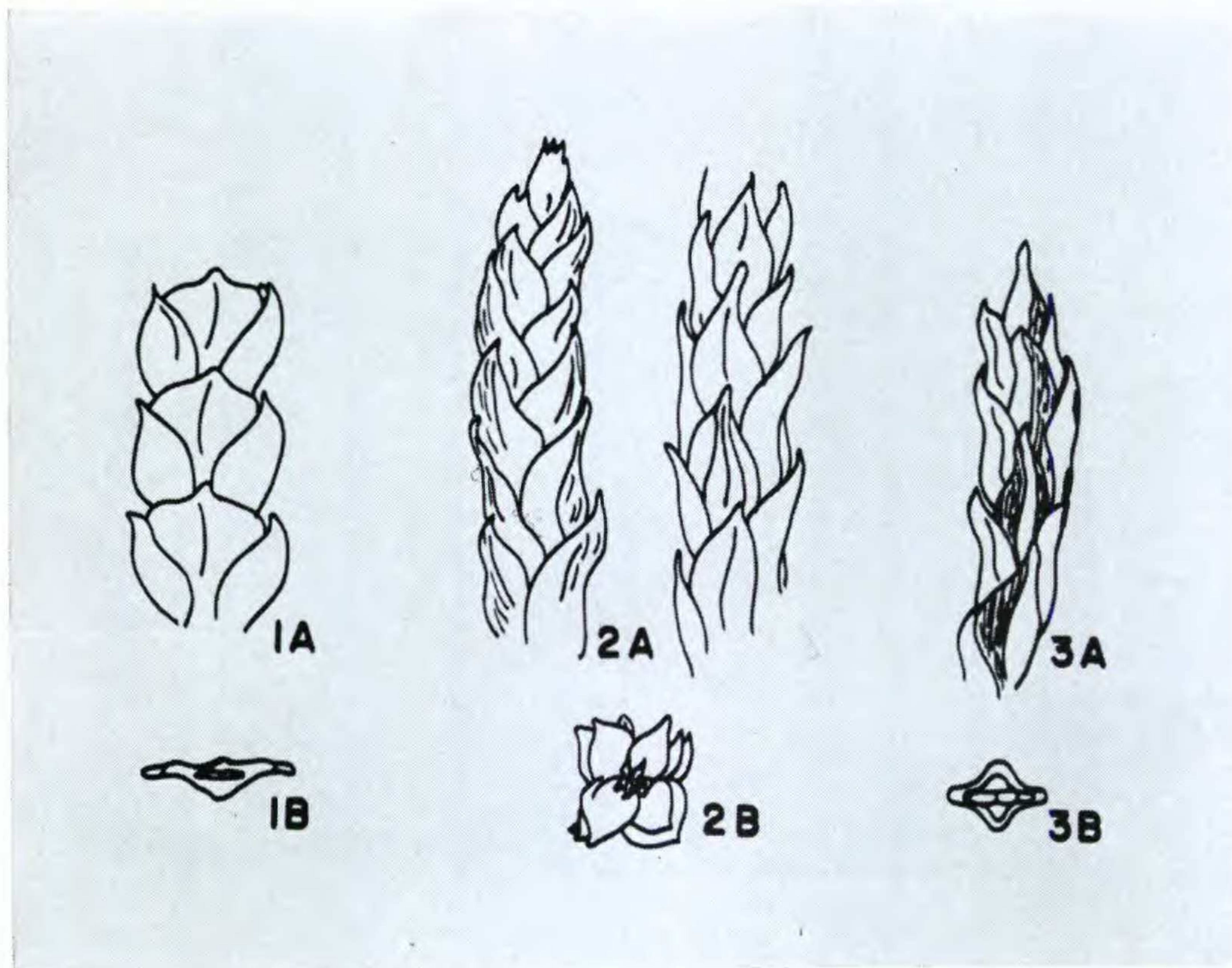


Figure 1. Branch and leaf form of typical *Thuja occidentalis* and the dwarf conifer in the Barron canyon. A — side view of branchlet, B — end view of branchlet: 1 — typical *T. occidentalis*, 2 — tetragonal, decussate form on dwarf conifer, 3 — lycopodiaceous form on dwarf conifer.

(2) Several branches bear fastigiata clusters of twigs with rows of divaricate, needle-shaped leaves 6-8 mm long. These appear juvenile but some are stiffer and more sharply pointed. They may develop in a gradual sequence out of the first type and revert again to it (Fig. 2B).

(3) A few small sprays bear leaves similar to but usually smaller than (1). These branchlets are flattened, without the constricted segments of normal *T. occidentalis*, and are intensely branched in the manner of *Lycopodium tristachyum* Pursh (Fig. 1; 3A, 3B. Fig. 2C).

DISCUSSION

The shrub bears no external resemblance to a normal *Thuja occidentalis*. A search of botanical and horticultural

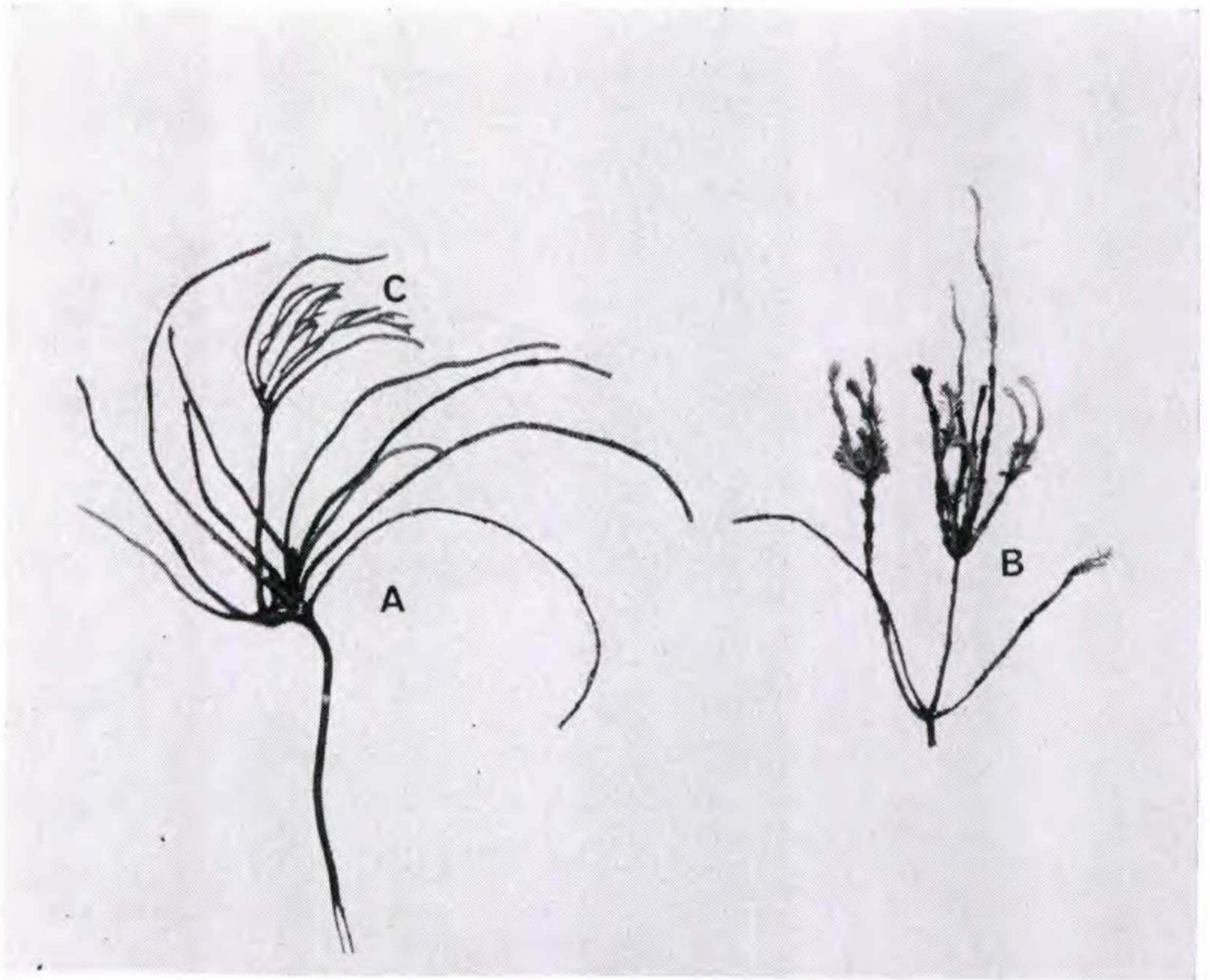


Figure 2. Branches from dwarf conifer in Barron canyon. A — tetragonal, whip-like branch, sparingly ramified, B — fastigiata cluster with juvenile-type needles, C — lycopodiaceous form of branching.

tural literature reveals no such specific entity. The forma *prostrata* of Vict. & Rousseau has normal adult leaf structure and differs mainly in habit. Var. *ericoides* Beiss. & Hochst., which is also a cultivar, bears only small resemblance to parts of the shrub with juvenile-type needles. The cultivar, '*Douglasii*' Rehder, given as a synonym for '*Filiformis*' Beiss., has some similarity with it and is described as a compact shrub with slender, pendulous branches often flattened at the tip. Bailey (1923) says these branches are partly four-angled with sharply pointed leaves, but his illustration shows very typical *T. occidentalis* foliage. Rehder (1901), the authority for the variety, states that the stronger shoots are round, covered with widely-spaced, long, pointed and somewhat projecting leaves, but that there is

no juvenile foliage. The illustration of Welch (1966) confirms this. '*Ohlendorfi*' has tetragonal branches with decussate leaves but the illustration in Welch shows a very compact shrub with upright branches.

The leaves of the tetragonal and lycopodiaceous branches do show an interesting resemblance to those of *T. orientalis* L., species of *Cupressus* and *Chamaecyparis* (Dallimore & Jackson, 1948) as well as to forms of *Juniperus*.

Horticultural forms of dwarf and other abnormal conifers are developed by mutation, self-pollination and hybridization. According to Welch most, if not all, cultivars of Arbor-vitae were originally the result of seed mutation. Such seedlings can be cultivated in a nursery, but in nature their chances of survival are not great. '*Spaethi*' (Anonymous, 1893), a synonym of '*Ohlendorfi*', was developed in this way from a seedling of *T. occidentalis*.

CONCLUSION

The question has been asked, is the shrub a monstrosity induced by the particular habitat in which it occurs, or is it a genetic form that arose as a result of self-fertilization, hybridization or mutation.

The shrub is close to the river where in some years it could be subject to damage from ice and high water; a visit in 1970 showed that this had recently occurred with damage to many of the long, tetragonal branches. The climate of the canyon is, in part, abnormally cool; several rare arctic-alpine species occur there (Moore, 1964) and on the first visit in late May two large ice falls were still present. The lower branches of cedars along the river are browsed. However, no other known cedars have abnormal leaves.

Abnormal leaf forms may appear on young conifers, usually under thirty years of age, after which they usually outgrow all or most of the characteristics (A. R. Buckley, Horticulture Division, Plant Research Institute, pers. comm., 1969). The shrub in question must be at least fifty

years old since Mr. Perem gave the age of a small branchlet 2.3 mm in diameter as more than twenty years.

The plant presumably could not have been a hybrid because no other species of *Thuja* grows naturally in Ontario. The canyon could not have been cultivated and what farms may have been in this area of the precambrian shield have returned to forest. It could have been due to self-pollination. However, it seems most probable that the shrub is the result of a spontaneous mutation. Unfortunately there is no evidence of flowering or cone development.

Mr. John Santon, Petawawa Forest Experiment Station, has rooted tiny cuttings of both juvenile and tetragonal foliage. Growth the first winter was generally of the tetragonal, decussate form common to the shrub but present summer growth is mostly of the juvenile type. Mr. Santon considers that this alteration of form may be seasonal but commented that a return to juvenile growth is frequent in cuttings.

The dwarf conifer in the Barron canyon appears to be a unique form. Its wood anatomy defines the shrub as *Thuja occidentalis* and the odor is characteristic of that species. It can be assumed that this Eastern white cedar was not induced by humans although the shrub does resemble in part several bizarre cultivars of the species previously described.

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